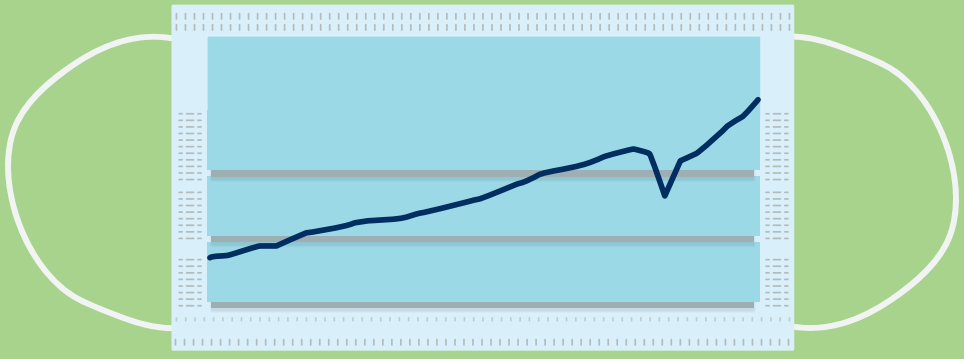
RECESSION REMEDIES

Lessons Learned from the U.S. Economic Policy Response to COVID-19



Edited by

Wendy Edelberg, Louise Sheiner, and David Wessel

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CHAPTER 8

Lessons Learned from Monetary and Fiscal Policy during COVID-19

Robin Brooks and Jonathan Pingle[1]

Introduction: The Pandemic Response, and Can It Be Repeated?

We hope the pandemic was a unique economic shock. The U.S. Congress, the President, and the Federal Reserve (the Fed), the nation's central bank, responded in force to support the economy and mitigate the negative effects of lost income for American households and businesses. In this chapter we review the experience in the markets for U.S. government debt to understand what the episode teaches us about the ability to respond to future crises and the interaction between fiscal and monetary policies.[2] The fiscal policy response played a crucial role in supporting the economy by replacing lost income and providing the types of economic support that monetary policy is not well suited to provide. The scale and the speed of the fiscal response, totaling more than $5 trillion, or more than 20 percent of GDP, was facilitated by the actions of the Fed, which helped to keep interest rates low and purchased more than $3 trillion of U.S. Treasury securities alongside the U.S. Treasury issuance.[3] Without the Fed's response, the ability of the Treasury to finance such a large,

1. We appreciate the expert research assistance of Jack Pingle and Lorena Hernandez Barcena. The authors would also like to thank Ben Bernanke, Steve Cecchetti, Ken Kuttner, Brian Sack, participants in the October authors' conference, and the editors of this volume for their insightful feedback. The views expressed in the chapter are those of the authors and not necessarily those of the Institute of International Finance or UBS. This chapter is for educational purposes only and should not be relied on for any other use. The reader is cautioned not to place undue reliance on forward-looking statements.

2. Similar issues are addressed in Reis (2022b).

3. Note that we use the fourth quarter of 2019 level of nominal GDP when we refer to shares of GDP. When we refer to debt, we refer to debt held by the public. The Fed is included in the definition of the term "public." For the descriptions in the Treasury's monthly statement of the public debt, see TreasuryDirect.gov (n.d.).

swift fiscal response without sparking a rise in borrowing rates seems to us unlikely, considering the evidence.

For example, worrying signs about debt issuance emerged during the pandemic. Foreign buyers of Treasurys played a much smaller role as a source of demand for Treasury bond issuance during the pandemic, in contrast to their large role following the 2008 global financial crisis (GFC). In addition, during past crises panic and risk aversion sent investors to the safety of Treasury securities. However, flows went the other way in early 2020, with foreign central banks selling Treasurys at the height of the crisis, pushing yields on Treasury debt higher. To improve market functioning, the Fed stepped in and bought Treasury bonds in large size, restoring order. While much of the turmoil in March 2020 reflects problems with the microstructure of the Treasury market (Financial Stability Board [FSB] 2020; Group of Thirty Working Group on Treasury Market Liquidity 2021; Vissing-Jørgensen 2021), the widespread selling of Treasury bonds is still an uncomfortable fact to consider when weighing the ability of the United States to respond rapidly to future crises.

Initial asset purchases by the Fed addressed market dislocation. Later, the Fed purchased Treasury bonds and agency mortgage-backed securities (MBS) to keep longer-term interest rates low, prevent unwanted tightening of financial conditions, and support economic recovery. The purchases are called large-scale asset purchases (LSAPs) or quantitative easing (QE). We survey empirical estimates of the impact on Treasury yields in this chapter. Overall, the Fed appears to have played a crucial role in facilitating the fiscal response by maintaining low Treasury yields at a time when the U.S. needed to issue a large amount of debt quickly. At the very least, the Fed helped avert any potentially harmful adjustment costs associated with the sharp rise in debt issuance in 2020 and 2021.

Treasury yields are determined by many factors, among them the amount of government debt outstanding. Despite the massive debt increase, for most of the past two years yields on U.S. government debt remained lower than prior to the pandemic and have failed to push much higher. Low real and nominal interest rates signal limited negative impact on economic growth that could result from rising debt issuance pushing up interest rates. Low rates paid on U.S. government debt also are important for keeping government debt service costs manageable. In this chapter, we evaluate why the pandemic response left yields low amid a sharp increase in supply of U.S. government debt. We use evidence from our evaluation to consider the implications for the scope of a future fiscal response to a crisis and what the potential limits might be.

We argue that one limit is inflation. Inflation could undermine the Fed's ability to keep (nominal and real) yields low for periods of time and in turn could also undermine the Fed's ability to help facilitate a large fiscal response to a future crisis. For example, if inflation had been high at the onset of the pandemic, the central bank response might have been more cautious. Or, if the policy response had proved to be highly inflationary right away, the central

bank might have been forced to raise real interest rates harmfully high to push inflation down. That, in turn, could have affected government borrowing costs, undone some of the economic benefits of the emergency response, or revealed a risk of too-high inflation or of too-high inflation expectations.

Intergenerational concerns should also be considered since fiscal stimulus or use of the central bank's balance sheet can be used in the near term at the expense of future generations' scope to do the same. All that said, as of this writing in March 2022, the U.S. experience does not yet appear worrisome and material room for a large, rapid, future fiscal policy response appears to remain. We argue, however, that this ability depends crucially on the independence and inflation-fighting credibility of the Fed, the stability of the U.S. dollar, and the maintenance of low and stable inflation.

Timeline and Description of Monetary–Fiscal Coordination

Before the onset of the COVID-19 pandemic, the Fed was undertaking regular purchases of Treasury bills to add needed reserves to the banking system.[4] Reserves are needed by banks to facilitate interbank payments, to satisfy regulatory requirements, and to accommodate withdrawals by customers. The mechanics are as follows: in exchange for a Treasury bill or bond, the Fed credits the seller's account in the banking system with reserves as payment for the security, thus expanding the overall level of reserves in the U.S. banking system. At the start of 2020, the Fed was purchasing $60 billion per month of Treasury bills (i.e., short-term U.S. government debt), and reinvesting up to $20 billion per month of the principal and interest payments from its MBS into U.S. government debt across the maturity spectrum. While not intended to put downward pressure on bond yields, the purchases were removing as much as $80 billion of U.S. government debt from private markets each month.

The Fed was also reviewing its monetary policy framework. Over the preceding decade, the Federal Open Market Committee (FOMC) largely failed to get inflation to its 2.0 percent target. This failure followed the Bank of Japan and European Central Bank chronically undershooting their inflation targets, even with their policy rates pinned at zero or below. At the start of 2020, no FOMC decision on a new strategic framework for monetary policy had been made, but the review was under way. The effective federal funds rate was 1.55 percent, at the lower end of the Fed's target range for the rate (1.50 –1.75 percent). The 10-year Treasury yield ended 2019 at 1.92 percent, a level that has only recently been reattained.

4. A fuller description of reserves is developed below in our discussion of the Fed's role and LSAPs.

On January 7, 2020, authorities in China confirmed a pneumonia-like virus as a novel coronavirus. The 10-year yield closed at 1.84 percent on January 17. On January 21, officials in Washington State confirmed the first case in the United States. Yields then drifted lower as investors began to de-risk, moving from assets like equities to the safety of U.S. government bonds. The rising demand for Treasurys pushed up their price and pushed down their yields, and the 10-year yield fell to 1.51 percent. As news worsened throughout February, the flight to safe-haven Treasury bonds intensified. The 10-year yield fell to 1.10 percent on March 2. On March 3 the FOMC voted to reduce the federal funds rate by 50 basis points (bps), citing strong economic fundamentals as well as risks posed by the coronavirus. Concerns mounted. The 10-year yield fell to 0.54 percent on March 9 and the 30-year yield fell below 1 percent, a new low.

Following OPEC's surprising failure to cut oil production at its March 5 meeting, oil prices fell sharply, dropping from $46 to $30 per barrel. Emerging market countries, many of whom are commodity exporters, were forced to defend their falling currencies, selling Treasury securities to raise cash. The 10-year Treasury yield rose sharply, reaching 1.20 percent in mid-March. In this dash for cash (or dash for dollars), some other investors facing redemption risk or locking in capital gains similarly moved to raise cash. Selling mounted and seized the market, pushing yields higher. Broker dealer balance sheets proved to be insufficient to intermediate the size of the sudden flows.[5] Along with the seizure of the Treasury market, concern over the economic outlook mounted. On March 15, in a rare Sunday decision, the FOMC cut the policy rate by a full percentage point, taking the target range to 0–0.25 percent. Importantly, seeking improvement in Treasury debt market functioning, the FOMC announced moving away from bill purchases to purchases of Treasury notes and bonds, saying it would be buying at least $500 billion in Treasurys and at least $200 billion in MBS over the coming months. To fulfill its role as lender of last resort, several emergency lending facilities were activated to provide liquidity backstops for other lending markets. The Fed lowered the primary credit rate at the discount window by 150 bps, which allowed banks to borrow directly from the Fed at 0.25 percent. By the end of March, market

5. Following the turmoil in the Treasury market in March 2020, the Fed created two new facilities that—if selling pressure in the Treasury market recurs—would provide a way for market participants to temporarily convert their Treasury securities into dollars, or cash, without selling them. The Fed's Standing Repo Facility provides overnight loans to eligible counterparties who post their Treasurys as collateral. This facility lends at a higher rate than interest paid on reserve balances, but also can allow banks to access reserves directly from the Fed in times of stress. In addition, the Federal Reserve Bank of New York now offers Foreign and International Monetary Authorities (FIMA) account holders a similar service, allowing them to pledge the Treasury securities held in their custodial accounts at the Federal Reserve for overnight loans in dollars. This may reduce the need for foreign official institutions to sell Treasurys when emerging market or other currencies are depreciating, or when they are in need of dollar funding but might not have access to other existing Fed swap lines.

functioning had been restored to the Treasury market and the 10-year yield was back down to 0.70 percent.

A full review of those Fed emergency lending facilities is beyond the scope of this chapter, but two of those facilities represented novel examples of monetary–fiscal coordination. After the GFC, the Fed set up facilities that would lend to private markets, as a backstop and usually at a penalty rate, to make available liquidity to support orderly market functioning. Similar market backstops, with the cooperation of the Treasury and this time seeded with some emergency funding from Congress, were reintroduced during the pandemic.[6] One of the new facilities was the Paycheck Protection Program (PPP) liquidity facility. The PPP was a pandemic lending program created by the Coronavirus Aid, Relief, and Economic Security Act (CARES Act) and was administered by the U.S. Small Business Administration. The PPP provided loans to businesses with the stated purpose of keeping employees on the payroll during the pandemic (see Chapter 4). To support banks providing the credit, the Fed extended credit to eligible financial institutions that originated PPP loans; those institutions then used the PPP loans as collateral. The action was like creating a secondary market for PPP loans on short notice, supporting the flow of credit to firms. The Fed's facility was an attempt to help make fiscal policy more successful.

The second novel example of monetary–fiscal cooperation was the creation of the Municipal Liquidity Facility. It was designed to purchase short-term notes from U.S. states and municipalities meeting certain criteria. In other words, it extended credit directly to some states and cities. While the facility was little used, the existence of such a market backstop contributed to orderly functioning of the municipal securities market, which was an important source of credit for states and municipalities that were managing their own fiscal responses to the pandemic. The facility was seeded with CARES Act funds and was established in coordination with the Treasury (see Chapter 6). Both facilities now provide a template for potential future cooperation.[7]

But the scale of what occurred in the market for Treasury debt was extraordinary. In seven weeks during March and April 2020, the Fed's System Open Market Account (SOMA) purchased $1.45 trillion of Treasury debt. The Fed undid the dislocation that had pushed up yields, and restored more normal functioning, with orderly transactions and auctions of new issuance. In addition, the

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6. A full list with links and explanations can be found in the policy tools sections of the Federal Reserve's website (Board of Governors of the Federal Reserve System n.d.a., n.d.b.). Note that, in evaluating the Coronavirus Aid, Relief, and Economic Security Act, or CARES Act, the CBO estimated the seed funds for the Fed facilities to be deficit neutral. As of this writing in early 2022, of the $114 billion in Treasury contributions to the credit facilities, most has been returned to the Treasury, with only $21 billion remaining, because the facilities have been, or are in the process of being, wound down. Note that the special lending facilities are set up only under certain emergency conditions and/or with the approval of the Treasury.
7. The Federal Reserve Act does allow the Fed to purchase state and municipal debt in the secondary market (open market operations), but with a number of restrictions. See Section 14, subsection 2b of the Federal Reserve Act.

FOMC pledged ongoing purchases to support market functioning and—once market functioning had been restored—settled into a more traditional LSAP, purchasing securities at a pace of $80 billion of Treasury notes and bonds and $40 billion of agency MBS per month. In the 18 months ending in June 2021, the Fed added $2.9 trillion to its holdings of U.S. government debt, bringing the total in the SOMA to $5.2 trillion in June 2021.[8]

The fiscal response was extraordinary, too. Two legislative responses, passed in early and mid-March, provided funds to state and local governments, provided payments and tax credits to employers, and expanded sick leave. The more significant response, the CARES Act, passed in late March. Initially estimated to cost $1.7 trillion, the bill provided support to businesses and health-care providers, and provided additional funding to state and local governments. Additional funding was enacted in late April. The overall deficit impact of the four bills was expected to exceed $2 trillion in just fiscal year 2020, the year ending September 30.[9]

On April 29, 2020, Fed chair Jerome Powell urged lawmakers to use the great fiscal power of the United States to defeat COVID-19 (Powell 2020). He said that monetary policy alone would not suffice; this is a theme he would revisit during the pandemic. With lost income and business central to the economic problem COVID-19 posed, monetary policy was not the right tool for the job. In May 2020, the Speaker of the House Nancy Pelosi reported that the Fed chair urged Congress to "think big" and take advantage of low interest rates (Pelosi 2020a). The House passed a $3 trillion relief bill later that month; on the House floor the speaker said, "We have the responsibility and opportunity to think big, as he [Powell] advised" (Pelosi 2020b). Treasury markets watched this unprecedented monetary–fiscal cooperation amid continued low yields. However, further meaningful fiscal action was delayed until late December 2020, after the general election on November 3. After employment fell by well over 20 million in March and April 2021, employment rebounded in May with the beginnings of reopening and economic recovery began. The 10-year yield was largely rangebound from early April 2021 until early June 2021, at between 0.6 percent and 0.8 percent.[10]

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8. Over 78 weeks ending the end of June 2021, the Fed purchases of Treasury debt totaled $2.9 trillion; over the 104 weeks ending February 23, 2022, those purchases totaled $3.3 trillion, bringing total holdings in the SOMA to $5.7 trillion.

9. As part of that cost estimate, the new Fed facilities established by the legislation were expected to show no losses and thus to have a cost of zero.

10. The Fed also implemented several facilities to backstop private markets that stabilized market conditions across credit markets and municipal borrowing. Although the Fed was designed to be the lender of last resort at a time when the vast majority of lending was done by banks, it responded to the pandemic by implementing several facilities to backstop credit markets, an important source of lending in today's financial system. The initial rebound in employment in May pushed yields above 0.9 percent ahead of the Fed's June meeting, but then settled back into the range for the remainder of the summer.

At the annual Jackson Hole Economic Symposium on August 27, 2021, Chair Powell announced the results of the Fed's framework review (Powell 2021). First, the FOMC would seek to achieve inflation that averages 2.0 percent over time. Previously, the committee had sought 2.0 percent inflation (called inflation targeting), but if inflation spent more time below 2.0 percent than at 2.0 percent, those bygones would be bygones and inflation could easily average something below 2.0 percent, as it had for the preceding decade. Going forward, if inflation spent time below 2.0 percent, it would need to spend time above 2.0 percent, and the public should expect an overshoot. The rule was not meant to be hard and fast like a specific target for a level of prices. Hence, the strategy that replaced inflation targeting was called "flexible average inflation targeting."

Second, Powell (2021) announced that the FOMC would seek to eliminate shortfalls from maximum employment. In other words, employment shortfalls below target would require a policy response to be eliminated; if employment was above or better than estimates of maximum employment, however, there would be no preemptive policy response to push employment back down, unless sufficient inflation materialized to put maintaining the inflation target at risk.[11] The framework change was not a response to the pandemic, but rather was an attempt to retain the policy space to fight future downturns more effectively.

The next step in fighting the economic crisis came with the forward guidance the FOMC introduced in September 2021. By then, yields had begun to grind higher as recovery became more likely, and vaccine progress continued. However, the FOMC wanted to prevent potential undue tightening of financial conditions, and to deploy its tools as best it could to support the economic recovery. At its September meeting, the FOMC made a lower-for-longer commitment, nesting forward guidance within the new policy framework. The committee expected that it would be appropriate to maintain the funds rate near zero until three economic conditions had been met: the labor market had returned to full employment, personal consumption expenditures (PCE) inflation had risen above 2.0 percent, and inflation was expected to overshoot the 2.0 percent target.

At its December 2020 meeting, the FOMC adopted forward guidance for the asset purchase program, saying it expected to maintain the purchases of $80 billion per month of Treasury securities and of $40 billion per month of agency MBS until the economy made "substantial further progress" (Board of Governors of the Federal Reserve System 2021a) toward the committee's goals. The LSAPs were also acknowledged to be part of the monetary policy response and not just to support market functioning.

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11. In his speech Chair Powell noted the erosion of policy space from generally declining neutral interest rates (the underlying trend in the structure of rates) over the preceding two decades, and the compounding problem of declining inflation expectations (Powell 2021). The Fed sought to arrest the erosion of its policy space with the new framework, and to better anchor inflation expectations at its 2.0 percent target.

The next catalyst for Treasury markets followed the election of Joseph Biden to the presidency. First, a bipartisan budget bill (the Coronavirus Response and Relief Supplemental Appropriations Act) that had been enacted at the end of 2020 included another about $900 billion in fiscal stimulus to address the hardships caused by the pandemic. Then, the subsequent run-off election of Georgia's two Senate seats led to Democratic party control of both houses of Congress as well as the White House. The prospects for further fiscal expansion pushed up market expectations for growth, inflation, and debt issuance. On January 5, 2021, the 10-year yield closed at 0.96 percent. January 6, the day after the Georgia run-off election, yields closed at 1.04 percent and were 1.15 percent on January 11. The incoming Biden administration began discussing an ambitious fiscal response. On March 11 the $1.9 trillion American Rescue Plan Act of 2021 was enacted. Combined with vaccines and economic optimism, the 10-year yield ended the first quarter of 2021 at 1.74 percent.

After that quarter, expectations of debt issuance crested. Despite the amount of spending approved in the fiscal legislation, on February 3, 2021, the Treasury announced that the past year's increases in nominal coupon (maturities longer than bills, or two years and beyond) issuance created sufficient capacity to address near-term borrowing needs. Many analysts thought the Treasury might reduce coupon auction sizes at some point in the coming quarters, which has in fact occurred. As the remainder of 2021 unfolded, Congress also passed a bipartisan infrastructure spending bill and a budget resolution that would widen deficits by another $1.75 trillion over a decade.

Following that extraordinary monetary and fiscal response, inflation moved higher in 2021. The Fed announced its intention to begin to pare back asset purchases in September 2021. In the fourth quarter of 2021, core PCE inflation moved above 4 percent, which was above the Fed target of 2.0 percent. Some observers became concerned that the increase in inflation might not prove transitory. The FOMC announced it would accelerate its exit from the LSAPs in December. In January 2022, the FOMC said that it would be appropriate to raise interest rates "soon" (FOMC 2022). Investors were substantially changing their views of the Fed's asset holdings, as expectations that the Fed would shrink its holdings became more widespread and were pulled forward. As of this writing in March 2022, core PCE inflation is more than 5 percent, and headline inflation is roughly 6 percent. Expectations for interest rate increases had repriced substantially higher compared to only five months earlier. As of this writing, the 10-year Treasury yield is above 2 percent, as the Fed stands poised to raise interest rates, with a series of rate hikes priced into Treasury bond valuations.

The magnitude of the policy response was historic. Net deficit spending in response to the pandemic and to support the recovery totaled more than $5 trillion. Estimates of debt-to-GDP for fiscal year 2021 were revised up 20 percentage points in a year, under current law. The next-largest fiscal expansion in the past 100 years was during World War II, when debt-to-GDP rose 65

percentage points. Then, too, the Fed played a role, for a time keeping wartime borrowing costs low by targeting certain yields for U.S. government debt, which ensured the ability of the Treasury to issue debt as needed without a spike in borrowing costs. The war's debt burden was then reduced in the decades that followed. Today, the ratio of debt held by the public to nominal GDP has risen to more than 100 percent, nearing the World War II peak of 106 percent. Looking ahead to the next crisis: Will the United States have the fiscal space needed to fight a war, respond to a pandemic, or support the economy in a very deep recession, particularly when monetary policy is constrained by the zero lower bound on nominal interest rates?

Three points are worth noting. First, even before the pandemic, the long-run fiscal outlook for the United States was not expected to stabilize without changes to fiscal policy. Debt projections climbed rapidly beyond the 10-year budget window. The massive increase in debt during the pandemic made these challenges worse: CBO's March 2021 long-run projections show the debt rising to 200 percent of GDP under current law over coming decades.[12] Second, interest rates matter for the ability to finance that debt, and to keep debt service manageable. Finally, as costless as any spending might appear to be, there is a limit to how much debt the United States government can issue without significant increases in interest rates, which raises important trade-offs for policymakers to consider. Does today's deficit-financed response to the crisis risk limiting a future generation's response?[13]

Another important part of the backdrop is the decline in neutral real interest rates. Nominal and real interest rates in developed market economies have declined noticeably over the past several decades. Some estimates suggest that the neutral real policy rate, or the equilibrium level of the FOMC's overnight policy interest rate, had fallen almost 2 percentage points during the past few decades. In the United States, that decline since 2000 moved in the opposite direction of the ratio of government debt-to-GDP, which in theory should push up neutral interest rates. In the year preceding the pandemic, market-implied expectations suggested that real neutral interest rates would remain low in the coming years.

That decline in neutral real rates led to rethinking the role of fiscal policy. As Olivier Blanchard (2019) said, "Put bluntly, public debt may have no fiscal cost." Lukasz Rachel and Lawrence Summers (2019) show that advanced economies' neutral rates fell around 300 bps in the half century leading up to COVID-19, a phenomenon they link to global savings. Many factors may have driven the decline in neutral rates, including slowing potential output growth across advanced economies coming from lower productivity growth and population aging. Policy rates' proximity to their effective lower bound might also raise

12. For the detailed assumptions, see the CBO outlook (CBO 2021).

13. As discussed in Reis (2021, 2022a), some could argue that the United States trimming its primary deficit to, say, 2.5 percent, and such a rate structure keeping net interest payments under 2.5 percent, would be sustainable in the long run.

expectations for future LSAPs, which could reduce term premia. There is also a literature on excess savings that harks back to work on the global savings glut, a term pioneered by Ben Bernanke (2005). In more recent work, Thiago Ferreira and Samer Shousha (2021) argue that the global net supply of sovereign safe assets (traded in secondary markets) plays an important role in real neutral rates. While added supply (say, rising U.S. government debt) was estimated to have pushed up real neutral rates, the accumulation of safe assets by official institutions and central banks was estimated to have pushed down real neutral rates. Blanchard (2019) argued that nations could be better off with expansionary fiscal policy, given the outlook for low real neutral interest rates to remain in place in the coming years. If the real rate of interest on government debt is lower than the rate of return from investment financed by that debt, society could be better off by increasing government borrowing. If the interest rate on government debt, r, is less than the growth rate of aggregate output, g, that possibility seems more likely.

As of this writing, market-implied estimates of real neutral rates remain low. Longer-run inflation expectations remain within their post-2000 ranges. Responding to the pandemic with a fiscal response seems unarguably the right thing to have done. In the case of the pandemic response, not only was there a clear role for fiscal policy, but the Fed played an important role too. The Fed lowered interest rates at a time when the Treasury needed to issue a historic amount of debt, and very quickly. The Fed also ensured market access for the Treasury by its forceful response to improve market functioning. We are still running this experiment, however, and the longer-run effects of the increase in debt remain to be seen. We discuss these takeaways in more detail below.

Fiscal Expansion: Role of Domestic and Foreign Demand for U.S. Government Debt

During the COVID-19 pandemic, holdings of U.S. government debt expanded among some parts of the buyer base, but not among others. Primarily four types of buyers added to their holdings on net: First, Fed holdings increased the most, by far.[14] Second, money market funds that limit their holdings to government or agency debt played the second largest role. Third, domestic depository institutions, for whom holdings of Treasury or government agency debt satisfy regulatory requirements, added holdings. Fourth, overseas investors added to net holdings, though in much smaller amounts than during the GFC.

Other than foreign investors, no type of investor other than the Fed or investors facing a meaningful regulatory requirement to own Treasury bonds added significantly to their net holdings of U.S. government debt during the

14. We ignore state and local government holdings for the most part. Their holdings of Treasury bonds include special series, and they also received funds from the fiscal expansion that they, in turn, will spend over time. The simplification we argue does not detract from the points made in the chapter.

TABLE 8.1

Flow of Funds Estimates of U.S. Government Debt Held by the Public

U.S. Government Debt Held by the Public	Treasury Estimates (billions of dollars)			Changes since 2019 Q4		
	2019 Q4	2020 Q2	2021 Q1	2020 Q2	2021 Q1	Share (%)
Total Liabilities	**19,019**	**22,371**	**23,943**	**3,352**	**4,924**	**100%**
Households (inc. HFs) and nonprofits	1,560	263	1,261	-1,297	-299	-6%
Nonfinancial business	138	192	140	55	2	0%
Monetary authority	2,541	4,808	5,273	2,267	2,733	55%
Money market mutual funds	1,037	2,350	2,363	1,313	1,326	27%
Pensions and insurance companies	1,278	1,359	1,405	81	127	3%
U.S. depository institutions	704	927	1,111	223	407	8%
Other banks and credit unions	291	302	264	11	-27	-1%
Mutual funds and ETFs	1,546	1,481	1,549	-65	3	0%
Broker dealers	230	268	19	38	-210	-4%
GSEs and other financial	267	439	382	172	115	2%
State and local governments	850	1,069	1,166	220	317	6%
Federal gov defined benefit plans	1,888	1,866	1,983	-21	95	2%
Rest of world	6,691	7,047	7,027	356	336	7%

Source: Federal Reserve Board Flow of Funds (Z.1) 2021b.

Note: Values are rounded to the nearest million. HFs refers to Hedge Funds.

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pandemic. Private domestic buyers, who were free from regulatory requirements or other restrictions, reduced their holdings of U.S. government debt. Table 8.1 shows holdings of U.S. government debt that changed during the pandemic based on the Fed flow of funds data.[15] Fed purchases accounted for 56 percent of issuance through the first quarter of 2021.[16] Money market mutual funds absorbed 27 percent and banks bought 8 percent. Foreign investors accounted for 7 percent of the newly available debt.

15. Similar decompositions can be done with the Treasury tables OFS-1 and OFS-2. Note that, in the Fed's flow of funds data, the term "households" also includes nonprofits and some types of investors, including hedge funds. In addition, the category includes the instrument discrepancy; for the time periods considered the fourth quarter of 2019 and the first quarter of 2021, however, that fact did not materially contribute to the change in estimated holdings.

16. Although debt issuance continued, as did Fed asset purchases, we thought this was a good interval to evaluate the rapid initial 12-month period's changes. The second quarter and third quarter of the flow funds data adds the complication of large fluctuations in bill issuance due to the debt management surrounding the debt ceiling, without revealing any meaningful differences in the takeaways. Indeed, as the Fed purchases continued, that share of debt taken down rises in the next two quarters.

Domestic banks took down roughly 8 percent of the pandemic increase in issuance. They are a natural buyer of Treasury debt because they are required to hold high-quality liquid assets to meet liquidity requirements and Treasury bonds have more favorable risk weightings than other assets used in computing regulatory capital requirements. Included in that definition is Treasury debt because it is both safe and very liquid. Thus, buying U.S. government debt satisfies important regulatory requirements for domestic banks.

Money market mutual funds, to some extent, are captive buyers of government debt due to regulatory requirements imposed following the GFC. Before the pandemic, 69 percent of money market assets were in funds restricted to holding short-dated U.S. government or agency debt, called government-only funds. Deposits in government-only funds soared as the Fed ramped up asset purchases in March and April 2020, the fiscal response began, and household savings rose. Government-only money market fund balances increased $1.1 trillion during the pandemic, and six quarters later represented roughly 80 percent of money market fund deposits, totaling $3.9 trillion. Government-only money market funds also can and do invest their cash—$1.7 trillion a day in February 2022—at the Fed's reverse repurchase (RRP) facility (effectively securities bought from the Fed with an agreement to sell them back at a fixed time and price). The high level of usage of the RRP suggests there will be ample demand for additional U.S. government debt if bill issuance increases.

As the policy response unfolded during the pandemic, households reduced spending and savings in the U.S. rose. Despite that rise in savings, households reduced their Treasury debt holdings, as shown in Table 8.1.[17] Hedge funds and some types of investors are included in that definition of households, but domestic hedge fund holdings fell by a little under $100 billion over the period shown in Table 8.1, from the fourth quarter of 2019 to the first quarter of 2021. Households accounted for roughly 40 percent of the money fund deposit growth through the first quarter of 2021, thus households indirectly added to their holdings of short-term U.S. government debt. However, our estimate of households' holdings from the flow of funds data indicates households reduced their Treasury holdings on net by somewhat more than their money fund balances rose over the six quarters after the fourth quarter of 2019.[18] Even accounting for households implicitly holding Treasury bills via their money market deposits, altogether households essentially failed to participate in absorbing the rapid rise in debt issuance to any meaningful degree.

After the GFC, overseas buyers of U.S. government debt played an important role in absorbing the additional U.S. government debt issuance. For

17. Even in the next two quarters of the flow of funds, the Treasury holdings of households had not recovered.

18. The timing matters somewhat because households' Treasury holdings fell, and money fund balances rose; overall, however, households as defined by the flow of funds data were not a meaningful net part of the buyer base during the pandemic.

example, after accounting for the issuance of debt during and following the GFC, overseas buyers' increases in holdings accounted for taking down most of the increase in debt held by the public. During the pandemic this share was much smaller. Historically, the rest of the world has been an important and sizeable holder of Treasury securities, and indeed is an important marginal buyer. Since the sharp fall in commodity prices in 2014 and a material rise in the dollar, foreign net flows into Treasurys have been close to zero in recent years, despite the large stock of overseas holdings. Overseas buyers' failure to participate in absorbing pandemic issuance raises important questions about whether, without the Fed, such a large amount of U.S. government debt could have been placed so quickly on such attractive terms.

Also, one might regard the banks and money market funds as somewhat captive buyers. That might not be quite fair for banks, but government-only money market funds can own only government or government agency obligations; for banks, government Treasury debt satisfies important regulatory requirements. Excluding their added holdings and the Fed holdings, the remaining U.S. government debt trading in bond markets has been stable at roughly 60 percent of GDP since 2018. In other words, the ratio of debt to nominal GDP held by the public (excluding the holdings of the Fed, money market funds, and domestic banks) has changed little between the days before the pandemic and a year after its onset. That could be one reason yields remained well contained in the face of new public debt issuance of more than 20 percent of GDP (Figure 8.1).

Why Yields Are Low: Inflation, Growth, and Neutral Rates

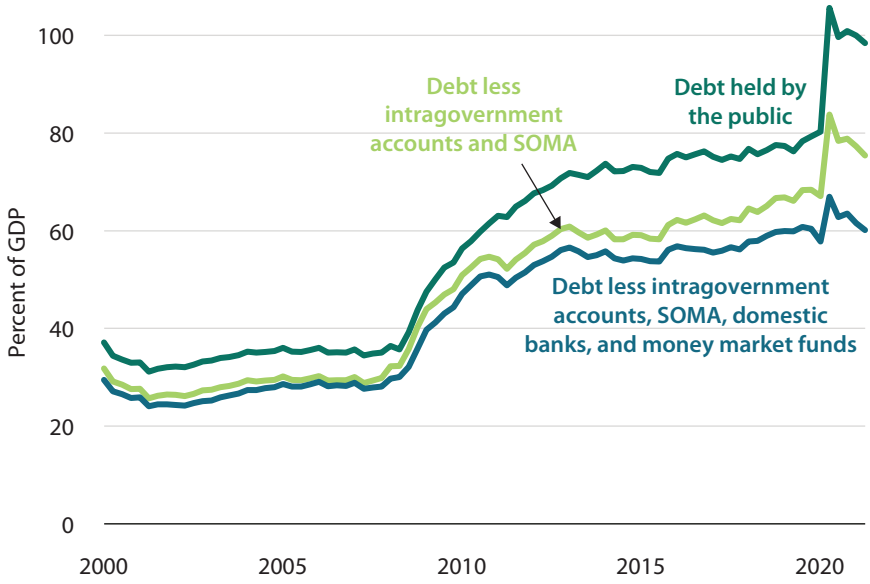
Below we decompose the 10-year Treasury yield into components. If market-implied futures are correct, the pandemic experience suggests little risk from bond markets of repeating this expansion of federal debt. Longer-run inflation expectations remain well contained, despite near-term inflation concerns, and market-implied assessments of future neutral rates remain low. We discuss the risks to that outlook later.

In Figure 8.2 the 10-year nominal Treasury yield is decomposed into four parts.[19] One component is the contribution of expected future inflation. A second is the inflation risk premium. Inflation erodes the value of the dollar and any dollar-denominated bond. The inflation risk premium represents the return that investors demand as compensation for expected future inflation and the risk of higher-than-expected future inflation. Overall, longer-run inflation expectations have returned to roughly pre-pandemic levels, remaining contained despite higher actual inflation. That is one reason why the 10-year nominal yield has not moved

19. We use the D'Amico, Kim, and Wei (DKW) decomposition (see D'Amico, Kim, and Wei 2018). Other decompositions and estimates of term premium and inflation compensation yield qualitatively similar contours.

FIGURE 8.1

U.S. Government Debt as a Percent of GDP



Source: Haver n.d.

Note: SOMA refers to System Open Market Account.

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higher with that inflation. Looking at other longer-dated forward indicators of inflation expectations in surveys and financial markets—for example, the expected five-year ahead rate of inflation five years from now—they remain in their post-2000s range, a period where actual inflation remained near or below 2.0 percent, on average. One risk going forward, and that could one day be viewed as the result of the pandemic response, is that the current high inflation feeds into those longer-run inflation expectations and pushes bond yields higher.

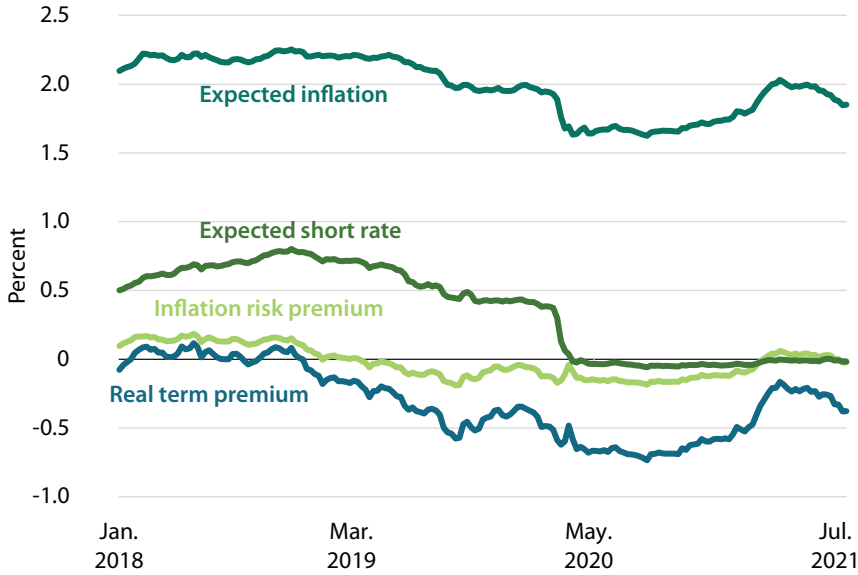
The third component is the real expected overnight interest rate.[20] This represents the real future path of the Fed's policy rate. This contribution to the 10-year yield is affected by expectations for growth and employment, as investors assess how the central bank might respond to economic conditions in the coming decade.[21] By the end of 2021, the market started expecting more Federal Reserve interest rate increases than it had during most of the pandemic,

20. The real overnight rate is the nominal rate over the period net of expected inflation.

21. To see how this contributes to the 10-year yield, imagine an overnight rate paid for 10 years into the future. An investor can earn that as an alternative, based on the Fed's overnight policy rate; the investor just needs to roll that investment daily for 10 years.

FIGURE 8.2

Nominal 10-Year Treasury Yield Decomposition, January 2018–July 2021



Source: D'Amico, Kim, and Wei 2018; Haver n.d.; authors' calculations.

Note: Decomposition produced with the D'Amico, Kim and Wei (DKW 2018) model.

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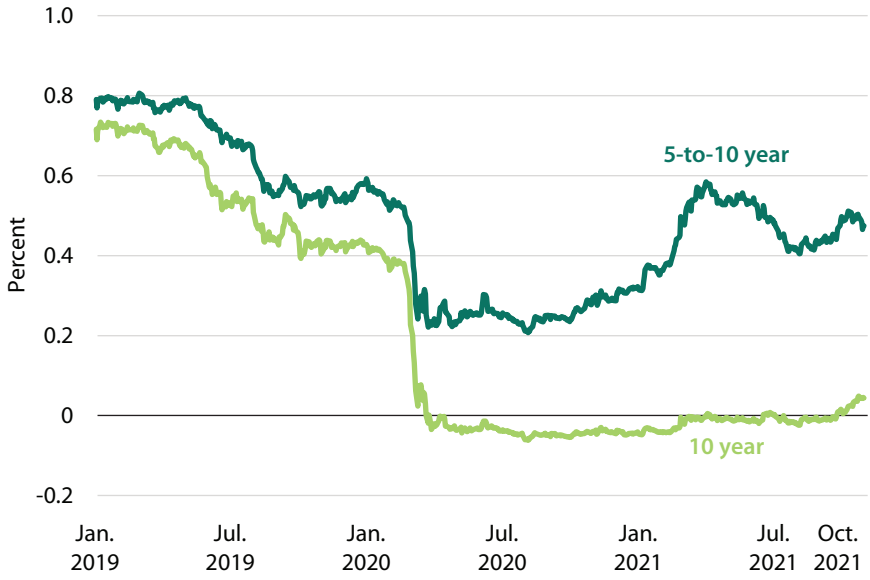
boosting the 10-year yield. If the FOMC were expected to raise rates further to fight inflation, those expectations would take the 10-year yield higher. As of this writing, the market expects much of the recent inflation rise to be temporary and expects the Fed rate-raising cycle to be relatively modest. That expectation is likely at least in part due to lingering concerns about growth; as a result, the contribution of expected real rates remains low.

The remaining component is the term premium. This is the additional compensation to investors for holding a longer-dated bond relative to what they would receive continually rolling over shorter-dated bonds. Risk can arise from that extra duration; here, "duration" is a term for the interest rate sensitivity of longer-dated bonds compared to shorter-dated bonds. Term premium is the component of yields influenced by portfolio choices, longer-term default risk, and supply (Treasury issuance) and demand (from domestic and foreign investors). In theory, term premium is the component most influenced by the Fed's LSAPs. Despite trillions of dollars of Fed purchases, the term premium today is no lower than it was pre-pandemic. Despite trillions of dollars of added

FIGURE 8.3

Expected Average Future Real Short Rate



Source: D'Amico, Kim, and Wei 2018; Haver n.d.; authors' calculations.

Note: Data produced with the D'Amico, Kim and Wei (DKW) model.

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government debt, it is not much higher, either. The Fed purchases could be offsetting some of the increase in term premium that would have otherwise occurred due to the substantial increase in Treasury supply.

Another important reason U.S. government bond yields remain low is that markets continue to think neutral interest rates are low. In Figure 8.3 we take the future path of the real short rate (policy rate) contribution to the 10-year yield and pull out the second five years: the expected real policy rate for the five-year rate five years from now. That five-year implied rate five years from now is far enough forward to assume that monetary policy will return the economy to a steady state, or equilibrium. Financial markets continue to see that forward rate five years from now as low, and in fact lower than pre-pandemic, despite the rise in debt-to-GDP, which would have been expected to put upward pressure on neutral rates. But neutral rates are also determined by other forces, such as potential economic growth in the future, demographics, and structural imbalances in savings and investment that investors expect

will persist.[22] Thus far, financial markets expect the low structure of rates to persist, which would help to keep government debt service manageable and suggests that the large fiscal response has been well absorbed. The jury is still out, however. A very important unknown is how real neutral rates evolve in the coming years, especially once COVID-19 is truly over.[23]

Quantitative Easing and Debt Issuance: Monetary Fiscal Coordination

"The problem with QE is it works in practice, but it doesn't work in theory."

—Ben Bernanke, January 16, 2014

When the Fed buys a Treasury bond, the seller is credited with reserves. Reserves are an instant demand obligation of the federal government, just like currency. This is why some argue that the Fed has monetized the debt. A cash-like equivalent, reserves are used in the interbank system to settle payments and can be converted to vault cash. Increasing the currency in circulation drains reserves. If an individual walks into a bank and withdraws cash, they are converting the reserves of the bank, held on deposit at the Fed, into currency. But through another lens, the Fed's purchase of a Treasury bond is simply a maturity transformation, rather than monetization. If we consider the Treasury and Fed on a consolidated government balance sheet, buying a Treasury bond by creating reserves simply exchanges a longer-term government obligation for an instant government obligation. The Fed pays interest to the banks on their reserve balances. Thus, in a consolidated form, the federal government swapped paying interest on Treasury debt for paying interest on reserves.

However, the Fed can adjust its balance sheet quickly, as it did during the pandemic. It can increase reserves rapidly with likely less disruption than if the Treasury decided to suddenly shift to issuing very short-dated bills so quickly. (More reserves apply downward pressure on overnight borrowing rates

22. As Ferreira and Shousha (2021) note, expanded government debt should push up neutral rates, but those effects can be mitigated by institutions like central banks that restrict the supply of that debt to market participants.

23. Financial markets inferred a decline of neutral rates in the year leading up the pandemic. That coincided with FOMC's own reassessment. According to the FOMC's quarterly Summary of Economic Projections, the longer-run nominal funds rate declined from 3.0 percent to 2.5 percent during 2019. That 2.5 percent longer-run nominal assessment of the FOMC was roughly similar to the 0.5 percent to 0.6 percent five-year forward real short rate estimate shown in Figure 8.3. Adding the FOMC's inflation target of 2.0 percent brings that estimate close to the 2.5 percent seen in the Summary of Economic Projections. The 5-to-10 year forward real short rate (five years forward) is lower now than pre-pandemic by about 10 bps.

while more bill issuance applies upward pressure.) Also, the surplus earnings from interest and principal on the bonds held at the Fed are remitted back to the Treasury. Now, as interest rates rise to ward off inflation, higher rates of interest will be paid on the reserves. But still, remittances from the Fed's asset holdings have become a meaningful source of Treasury revenue. In 2019, when the post-GFC Fed balance sheet shrinking had ended and the Fed had been raising interest rates, the Fed remitted $55 billion to the Treasury.[24]

With LSAPs, in the short run the Fed has removed the Treasury debt from trading in the bond market without replacing it with anything that trades in bond markets. Reserves are essentially restricted to the domestic banking system. The Fed purchases also removed longer-run securities from private hands and replaced them with an instant obligation—reserves—the interest on which tends to be lower than the longer-run yields paid on the debt the Fed purchased.[25] By removing longer-duration bonds (including agency MBS) the asset purchases put downward pressure on longer-run yields. Reducing the supply puts upward pressure on bond prices and downward pressure on bond yields determined by trading in private markets. That is one of the monetary policy–easing effects of QE.

In the long run, the estimated downward pressure on interest rates from the LSAPs diminishes. Part of the easing value might come from signaling the central bank's intention to keep rates low, which erodes as policy rate increases approach. The Fed may eventually allow the bonds that were purchased to mature without purchasing replacement bonds, which would remove or drain the reserves from the banking system, and put the debt back into the hands of the private sector. If the Fed tried to maintain the size of its balance sheet relative to GDP, and rolled over its bond purchases forever, such actions would, all else equal, keep monetary policy accommodative, and would, at some point, require tighter monetary policy along some other margin to keep inflation in check. Thus, in theory it is hard to see why QE would permanently lead to lower interest rates.

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24. Note that when reserves rose, currency in circulation, which drains reserves, also rose. While that may not be a first-order effect of LSAPs, currency drains reserves, replacing obligations that the government pays interest on (bonds and reserves) with an obligation the government pays zero interest on (dollar bills or Federal Reserve notes). Currency growth accelerated with the monetary and fiscal policy response, rising 21 percent (nearly $400 billion) over the six quarters ending the second quarter of 2021, and draining the equivalent amount of reserves. That is almost 2 percent of nominal GDP, which we would argue is not trivial, and on which the government pays no interest.

25. Obviously, this changes as interest rates rise. The Fed could also see the value of its holdings fall as the price of those holdings declines. However, given an upward sloping yield curve, in the short run, as would be the case early in an economic recovery, the Treasury would earn the spread between the interest paid on reserve balances and the interest earned on longer-term Treasury bonds and agency MBS, since the interest rate paid would be lower than the interest rates received. As noted in the example in the text, in the years following the GFC, the Fed remittances were a meaningful annual source of revenue for the Treasury. See Bernanke (2017) for additional discussion.

TABLE 8.2

Estimates of the Impact of Central Bank Asset Purchases on the 10-Year Treasury Yield in Basis Points

Study	Sample	Decline in 10-Year Yield Following a 1% Increase in Central Bank Asset Purchases
Modigliani-Sutch (1966, 1967)	Operation Twist	0 bp
Bernanke-Reinhart-Sack (2004)	United States	10 bp
Greenwood-Vayanos (2008)	Post-war United States (pre-crisis)	4 bp
Gagnon-Raskin-Remache-Sack (2011)	LSAP1	5 – 8 bp
Hamilton-Wu (2011)	U.S., 1990–LSAP2	4 bp
Hancock-Passmore (2011)	LSAP1 MBS purchases	8 bp
Swanson (2011)	Operation Twist	4 bp
Krishnamurthy–Vissing-Jorgensen (2011, 2012)	Postwar U.S., LSAP1, and LSAP2	4 bp
Christensen-Rudebusch (2012)	LSAP1, LSAP2, and U.K. LSAPs	2.5 bp
D'Amico et al. (2012)	United States, pre-crisis	11 bp
Neely (2013)	Effect of U.S. LSAP1 on foreign bond yields	4 bp
Bauer-Rudebusch (2013)	LSAP1, LSAP2	4 bp
Li-Wei (2013)	United States, pre-crisis	6 bp
Goldman Sachs (2013)	QE1, QE2	4 bp
D'Amico-King (2013)	LSAP1 Treasury purchases	25 bp
Goldman Sachs (2017)	QE1, QE2	4 bp
Kim-Laubach-Wei (2020)	United States (1990-2015)	12m: 4 bp; 24m: 0 bp
Goldman Sachs (2021)	COVID-19	4 bp
Brooks-Pingle (2021)	United States (1984-2021)	4 bp

Source: Adapted from Williams 2014; select authors.

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But, in the short run, there is a broad consensus among empirical studies in the academic literature that LSAP programs temporarily depress longer-term yields, with a few exceptions. Williams (2014) in a survey of the early literature found that $600 billion in LSAPs lowers the 10-year yield by 15–25 bps. We supplement the table from that presentation with other estimates (Table 8.2). Subsequent studies, including Hamilton (2018), have argued that early studies overstated the effect of QE on yields, because the novelty of LSAPs has worn off since QE1 was announced in March 2009, with markets less responsive to subsequent QE programs. Over time, consensus appears to have settled on an

estimate that, for every percentage point of nominal GDP in LSAPs, the 10-year Treasury bond yield is reduced by roughly 4 bps.[26]

To translate these estimates to the current episode, as of March 2022 the Fed will have bought more than $3.2 trillion in Treasury bonds, notes, and inflation-indexed Treasurys. That represents 15 percent of nominal GDP. The estimate of a little more than a 4 bp fall in rates for every percentage point of GDP increase in Fed purchases implies that the current level of the 10-year yield is around 70 bps lower than it would have been in the absence of QE; in other words, instead of, say, 1.5 percent, it would be around 2.2 percent. That counterfactual comes with many caveats.

As we described, QE amounts to a maturity transformation, with the Fed buying government bonds and in exchange issuing reserves, a short-term liability. Some argue removing duration should not matter much since reserves, a short-term obligation, are being issued instead, and the Fed holdings of longer-run debt are only temporary. Others argue that QE is rooted in the preferred habitat view of financial markets, whereby the Fed crowds investors out of bonds at longer maturities with the goal of pushing them into holding riskier assets. Or some argue simply that the demand for longer-dated Treasury bonds as a hedge in many portfolios creates a portfolio role with limited substitutes, and that reducing the supply pushes up the price.

The estimate could be too large. In addition to the theoretical arguments, many studies finding large effects are event studies from QE1; those event studies had a larger effect than subsequent QE programs. Second, as Fabo et al. (2021) argue, much of the discussion around the effects of QE might come down to a matter of perspective, with central bank studies finding generally larger effects than outside studies. Third, as Greenlaw et al. (2018) show, there is little evidence that QE influences yields over longer horizons, beyond the very near-term impact on markets.

However, the 4 bps estimate could be too low, too. First, investor expectations today likely foresee more of the Fed purchases of Treasurys as permanent additions to the Fed balance sheet than was the case for the QE following the GFC. Immediately following the GFC the Fed's guidance indicated the balance sheet would return to the minimum size necessary, which many expected to be a full return to precrisis size. In the end, the FOMC was able to reduce its balance sheet by only a small fraction of what was expected, less than $700 billion; that reduction ended in 2019, also sooner than many expected. Second, our estimated effect of 70 bps may be too small because it does not incorporate any impact for the removal of agency MBS, which is a close substitute in many portfolios. As a longer-dated asset, the agency MBS purchases amounted to a material amount of 10-year Treasury equivalents.

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26. For a summary of a wide range of empirical estimates and Treasury market analysis, see Goldman Sachs 2021.

TABLE 8.3

Estimates of the Impact of Fiscal Expansions on the Real Interest Rate in Basis Points

Study	Sample	Impact of 1 Percentage Point Increase in the Deficit-to-GDP Ratio	Impact of 1 Percentage Point Increase in the Debt-to-GDP Ratio
Gale-Orszag (2003)	U.S.	50–100 bp	N/A
Brook (2003)	Advanced economies	20–40 bp	1–6 bp
Engen-Hubbard (2004)	U.S.	18 bp	3 bp
Federal Reserve Board (2018)	U.S.	40–50 bp	N/A
Faini (2006)	Euro area	40 bp	N/A
Kinoshita (2006)	19 OECD economies	N/A	4–5 bp
Laubach (2009)	U.S.	20–30 bp	3–4 bp
Seliski-Gamber (2019)	U.S.	N/A	2–3 bp
Tedeschi (2019)	U.S.	18 bp	4.2 bp
Rachel-Summers (2019)	Review	40 bp	3.5 bp

Source: Select authors; please see the references for this chapter for additional details.

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The Impact of Rising Debt on Yields

Larger budget deficits and rising public debt should put upward pressure on interest rates. Conceptually consistent with standard macro models, higher debt issuance competes for available savings with other sectors of the economy, leading to a rise in real interest rates and potentially crowding out private investment in the process.[27] In Table 8.3 we summarize several estimates from the academic literature on the impact of fiscal expansion on yields. Rachel and Summers (2019), in a survey of the literature, find that a rise of 1 percentage point in the ratio of debt-to-GDP is associated with an increase in yields of around 3.5 bps. They also note that these estimates could understate the magnitude of fiscal expansions on real rates because the fiscal stance is measured with error. They argue this is because international capital flows, which will gravitate to where there is upward pressure on real rates, will tend to mitigate the rise due to more debt. Also, the countercyclical nature of fiscal policy means that low real rates will tend to coincide with expansionary fiscal policy.

27. See also: Warnock & Warnock (2009)

These elasticities imply that the sharp rise in public debt due to the pandemic response should have exerted considerable upward pressure on real interest rates. Working with the Rachel and Summers (2019) elasticity of 3.5 bps for every percentage point rise in debt-to-GDP, the roughly 20-percentage-point rise in public debt since the end of 2019 equates to around 70 bps on the 10-year Treasury yield. That happens to be almost the same order of magnitude as the downward effect on real rates from LSAP by the Fed. Altogether it could be that the 20-percentage-point rise in debt-to-GDP raised the neutral rate of interest in the United States, while the Fed's LSAPs and the ongoing pandemic have potentially concealed that effect in the short run. That would help explain why estimates of term premia have been so little changed, despite previously unimaginable central bank purchases and the largest peacetime fiscal expansion in the nation's history. Of course, the rise in private savings, lower investment demand, and the ongoing pandemic are all forces that could continue to hold down yields, too.

Beyond Today: We Are Still Running This Experiment

The longer-term effects on interest rates from this experiment in extraordinary fiscal and monetary policy are uncertain. As we note above, financial market pricing implies rates are expected to remain relatively low in the coming years. Nonetheless, as of mid-March 2022, the 10-year Treasury yield is up from its lows in 2020 and there are reasons to expect that it may continue to rise as a result of developments over the past two years. According to the estimates we just described, the increase in government borrowing is probably already putting upward pressure on interest rates, as the federal government competes with the private market for resources. However, some of that upward pressure on rates from crowding out private investment could be still to come.

Plus, interest rates have likely been held down somewhat by fears that the pandemic will usher in a period of weak long-term economic growth. Those fears, and the degree to which they have partly gone away, were probably one factor that led to the steep reduction in rates in 2020 and to the partial recovery since then. Yields could continue to move higher, and even potentially move higher than financial markets expect, if the fear of COVID's lingering economic impact continues to fade. What happens to interest rates also depends on what happens to inflation and inflation expectations. Inflation in March 2022 was at multi-decade highs. The recovery has been very strong and there is a sizable risk that the U.S. economy is genuinely overheating. If inflation expectations increase, nominal rates after the pandemic could end up permanently higher than would have been expected prior to the pandemic.

Although any decline in household savings in the United States may put upward pressure on interest rates, the change in composition of that savings

we argue will probably have only muted effects. Much of the large increase in savings in the United States over the past two years shifted into short-term liquid money market deposits that hold short-dated government debt. Even though those deposits may fall over time, the somewhat closed nature of the system of the U.S. banking system should mitigate some of the effects of the changing composition of deposits on Treasury yields.[28] However, the large stock of saving could be adding to the imbalance between saving and investment that we mention above may be one reason real neutral rates are low. We made the point that market-implied pricing suggests real neutral rates remain low and are expected to remain low in the coming years, but no one can be sure. The massive increase in Treasury issuance (as well as government debt in other countries) could be getting closer to satiating private investors' demand for safe assets, which for years has likely put downward pressure on government debt yields relative to other interest rates. In other words, the recent increase in global sovereign debt may mean that the neutral rate going forward could be higher than it was before the pandemic.[29]

The downward pressure on long-term interest rates from LSAPs should lessen over time too. Even if the Fed does not shrink its balance sheet, as the economy grows the Fed's balance sheet as a share of GDP would shrink. In addition, to the extent that LSAPs lower interest rates because of preferred habitats, the effects should fade over time as differences in yields across different types of assets are arbitraged away. Also, the Fed has signaled that it will reduce the size of its balance sheet over time. If removing the stock of longer-dated Treasury bonds from private markets put downward pressure on interest rates, returning that debt to private markets should put upward pressure on longer-term interest rates.[30] How this all evolves is unclear. The GFC also brought about a steep increase in federal borrowing and accommodative monetary policy. Yet, in the subsequent decade, the 10-year Treasury yield remained below the levels of 2006 and 2007. That previous period, however, might not be a good guide for this crisis.

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28. One household's payment for a good or service ends up being a counterparty's deposit. Or a reduction in deposits at a bank could end up as a deposit in a money market fund. While that may change the duration of the debt held by money market funds and banks together, the shift in deposits seems unlikely to meaningfully alter overall demand for Treasury debt.

29. In addition, for U.S. holders of Treasurys in particular, new regulations, a move to clearinghouse trading for government bonds, and new standing repurchase facilities at the Fed could all affect the decisions to hold government debt.

30. Note that the impact on private bond markets of the Federal Reserve reducing its holdings of Treasury bond securities, and the return of that issuance to private markets, depends on the U.S. Treasury Department too. In early 2022 the Treasury has been reducing the auction sizes of longer-term government debt. Should the Treasury issue less longer-term debt and more short-dated bills, that would likely offset some of the upward pressure on longer-term yields from the Federal Reserve's reductions of its Treasury holdings.

Is This Repeatable?

Two distinguishing features of the fiscal response were the size and the speed. Debt held by the public (including the Fed) expanded nearly $5 trillion (by about 20 percent of GDP) in just 12 months.[31] Could that have been accomplished without the Fed purchasing trillions of dollars of that debt at the same time? We have no counterfactual, but we suspect that, without the Fed's large purchases during the pandemic, the Treasury would probably not have been able to issue so much debt so quickly, and at such low interest rates. Indeed, market dislocation very well could have emerged without the Fed.

Considering the speed and size of debt funded at the low pandemic yields, and who did and did not help absorb the debt issued, leads us to emphasize the importance of the Fed in facilitating the fiscal response to the pandemic. The Fed purchases as of this writing are approaching two-thirds of the increase in debt held by the public since the pandemic's onset. Most of the rest of the private sector buyer base in the first year of the pandemic, aside from money market mutual funds, did not absorb the Treasury debt issuance to the same extent as they did following the GFC. Perhaps it is no coincidence that, in the past 100 years, the two largest U.S. fiscal expansions, World War II and the COVID-19 pandemic, occurred with the Fed playing a meaningful role in putting downward pressure on U.S. yields on bonds of longer maturities and not just downward pressure on overnight interest rates. In both episodes, the Fed helped keep yields low for at least the period in which the Treasury needed to access private markets and finance a large increase in government debt.

How often can the Fed do this? As often as necessary, we hope.[32] What is the ultimate limit? Inflation is the important limiting factor of the central bank's ability to facilitate such large debt issuance. Recall the earlier point that, if the central bank wanted to maintain its balance sheet size relative to GDP permanently, monetary policy would have remained accommodative, and eventually another margin of policy would need to be tightened to avoid sparking inflation. Thus, because of the need to tighten policy to prevent inflation, bonds cannot be simply added to the Fed's balance sheet with interest paid on reserves kept low, in perpetuity.

In addition, inflation risks the power of the Fed and fiscal sustainability. Although inflation reduces debt burdens in real terms, it creates costs, too, and would erode the value of the dollar as a reserve currency.[33] Inflation erodes central bank credibility. Say the central bank needs to provide accommodation or purchase assets to address a crisis; high inflation and the risk of

31. Debt held by the public rose $4.3 trillion in the 12 months ending February 2021, representing 19.8 percent of fourth quarter of 2019 nominal GDP.

32. In a recent paper, Ricardo Reis (2017) walks through in some detail the limits of a central bank issuing reserves to purchase the sovereign's debt.

33. See Hilscher, Raviv, and Reis (2014).

inflation rising further could prevent the central bank from providing sufficient accommodation to assist the real economy and to hold down interest rates in the wake of an increase in federal borrowing. Instead, the central bank would need to raise nominal and real interest rates to push down inflation. Recall former Fed Chair Paul Volcker: raising interest rates and recession were a necessary cure for the high inflation of the 1970s. The longer-run debt outlook for the United States is dependent on interest rates. Higher real rates to bring inflation down would raise the costs of debt service and slow economic growth. A credible central bank that keeps inflation near target can provide accommodation quickly and when needed, and keep longer-term inflation expectations anchored.

Hence, the independence of the central bank is crucial. The inflation-fighting credibility, something former Federal Reserve vice chair Don Kohn once described as hard-won credibility, is crucial, too. Looking across central banks whose balance sheets have been able to expand substantially, the European Central Bank and the Bank of Japan both have independence and credibility for maintaining low inflation, by choice or by historical record. With a garden variety demand-shock, inflationary pressures fall and the Fed lowers rates to spur demand. In another supply-driven recession, we might again find ourselves with inflationary pressure and low employment, a tension in the goals of the central bank. In either type of recession, however, if inflation expectations are easily unanchored and risk rising, the central bank might need to prioritize pushing inflation expectations back down rather than supporting demand in the near term. Should expansive LSAPs in response to one recession prove inflationary, inflation expectations in the next episode might move too high at the prospect of future LSAPs. Higher inflation expectations at the start of a downturn may lower real interest rates and thus support demand, but unanchored inflation expectations that subsequently need to be pushed lower would be harmful in the long run.

Considering our ability to respond to future crises, the fiscal response to the pandemic was helped by low yields and also, we argue, was helped by the Fed. To repeat the response requires yields to remain low, unthreatened by the fiscal outlook, and the Fed needs to retain its inflation-fighting credibility. Currently, that credibility remains in place, but inflation also sits at post-1980s highs. Should the high inflation prove persistent, then the lessons learned from this episode will look very different and suggest that the responses, both fiscal and monetary, were perhaps too much or ill-conceived. Inflation could also limit the ability of the Fed to facilitate a large fiscal response to the next crisis. As of mid-March 2022, projections are that the elevated inflation will move lower over time, and also that neutral rates will remain low.

Concluding Remarks: Lessons Learned

The swiftness and severity of the COVID-19 shock presented policymakers with unprecedented challenges. The pandemic is not over, and a lot of its history remains to be written. Here we draw several conclusions.

First, the Fed—by way of very large emergency QE—was able to restore order to the Treasury market sell-off in March 2020. In the space of seven weeks in March and April that year, the Fed bought $1.45 trillion in Treasury securities, a staggering amount, which stabilized the market and ensured smooth functioning. In the aftermath of that demonstration, markets have little doubt that the Fed is willing to do whatever it takes to maintain orderly functioning in the Treasury market, which is an important signal. Through subsequent ups and downs of the COVID-19 pandemic, functioning in the Treasury market has been smooth. Orderly market functioning for U.S. government debt is a prerequisite for U.S. Treasury issuance to finance fiscal stimulus.[34]

Second, the large-scale fiscal stimulus required historic budget deficits and debt issuance on short notice, which was facilitated by the Fed. Markets accepted this novel monetary–fiscal cooperation without a tantrum, even in the face of rising inflation fears. Government bond yields remain near pre-pandemic levels and the dollar's value is strong: both of these facts show the power of the Fed. This power is the exorbitant privilege of the United States. On the surface, this power also suggests that the ability to fund large fiscal deficits without adverse consequences is vast and suggests that policy space should remain ample at the current juncture. Nevertheless, how inflation unfolds in the coming years is an important concern.

Third, the ability to expand the deficit that much and that fast should not be taken for granted. Looking at who bought Treasury debt when it needed to be bought in large quantities, some traditional buyers such as overseas investors and many types of domestic investors without a regulatory incentive failed to absorb as much as they have in the past. As of early 2022, the United States' ability to fund its budget and trade deficits looks ample, and the dollar remains strong. However, in running this experiment, those margins were not stressed, in part because the central bank could quickly shift and adjust its expansive balance sheet and issue reserves to help accommodate the fiscal response.

Still, many questions will need to be settled in coming years. Where the 10-year yield lands once the COVID-19 crisis is truly over is an open question. While yields are currently low in mid-March 2022, an end to the pandemic could send yields higher. Just because the dollar is strong as of this writing and the current low level of yields looks enticing does not mean that either will be so on a longer-term horizon. In addition, concerns around overheating of the U.S. economy and inflation are front and center. Not only could such overheating send yields higher, but it could also limit a future crisis response.

34. Reis (2022a; 2022b).

As a result, it is too soon to say with confidence how many times the United States can afford to repeat this policy experiment. We have been lucky that it has been successful thus far during COVID-19, but we should use caution in extrapolating too far into the future in terms of policy implications and lessons.

Finally, we argue that an important lesson has been confirming the crucial importance of defending an independent and credible central bank in the Federal Reserve. After all, unprecedented policy activism has coincided with a strong U.S. dollar, low yields, and little market concern over the longer-run inflationary fallout from our policies. This is likely due to the independence of the Federal Reserve, which—even with the recent rise in inflation—is keeping longer-run inflation expectations anchored, so far.

References

American Rescue Plan Act of 2021 (ARP, or COVID-19 Stimulus Package), Pub L. No. 117-2 (2021).

Bauer, Michael D., and Glenn D. Rudebusch. 2013. "The Signaling Channel for Federal Reserve Bond Purchases." Federal Reserve Bank of San Francisco, Working Paper Series, April, 1–48.

Bernanke, Ben. 2005. "The Global Saving Glut and the U.S. Current Account Deficit." Remarks by Governor Ben S. Bernanke at the Sandridge Lecture, Association of Economists, Richmond, VA, April 14, 2005.

Bernanke, Ben. 2014. "Central Banking after the Great Recession: Lessons Learned and Challenges Ahead. A Discussion with Federal Reserve Chairman Ben Bernanke on the Federal Reserve's 100th Anniversary." Excerpt. Brookings Institution, Washington, D.C.

Bernanke, Ben. 2017. "Monetary Policy for a New Era." Peterson Institute for International Economics, Washington D.C.

Bernanke, Ben, Vincent Reinhart, and Brian Sack. 2004. "Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment." *Finance and Economics Discussion Series* (48): 1–113. Board of Governors of the Federal Reserve System, Washington, D.C.

Blanchard, Olivier. 2019. "Public Debt and Low Interest Rates." *American Economic Review 109* (4): 1197–229.

Board of Governors of the Federal Reserve System. 2018. "FRB/U.S. Model." Board of Governors of the Federal Reserve System, Washington, D.C. Accessed at https://www.federalreserve.gov/econres/us-models-about.htm.

Board of Governors of the Federal Reserve System. 2021a. "Federal Reserve Issues FOMC Statement." Press Release, July 28. Board of Governors of the Federal Reserve System, Washington, D.C.

Board of Governors of the Federal Reserve System. 2021b. "Financial Accounts of the United States—Z.1." Board of Governors of the Federal Reserve System, Washington, D.C. Accessed at https://www.federalreserve.gov/releases/z1/.

Board of Governors of the Federal Reserve System. 2021c. "The Fed—Selected Interest Rates—H.15 ." Board of Governors of the Federal Reserve System, Washington, D.C. Accessed at https://www.federalreserve.gov/releases/h15/.
Board of Governors of the Federal Reserve System. n.d.a. "Coronavirus Disease 2019 (COVID-19)." Board of Governors of the Federal Reserve System, Washington, D.C.
Board of Governors of the Federal Reserve System. n.d.b. "Monetary Policy." Board of Governors of the Federal Reserve System, Washington, D.C.
Brook, Anne-Marie. 2003. "Recent and Prospective Trends in Real Long-Term Interest Rates: Fiscal Policy and Other Drivers." Working Paper 367, Economics Department, Organisation for Economic Co-Operation and Development, Geneva, Switzerland.
CARES Act (Coronavirus Aid, Relief, and Economic Security Act), Pub.L. 116–36 (2020).
Congressional Budget Office (CBO). 2021. "The 2021 Long-Term Budget Outlook: Report." Congressional Budget Office, Washington, D.C.
Christensen, Jens H. E., and Glenn D. Rudebusch. 2012. "The Response of Interest Rates to U.S. and U.K. Quantitative Easing." *Economic Journal* 122(564): F385–414.
D'Amico, Stefania, and Thomas B. King. 2013. "Flow and Stock Effects of Large-Scale Treasury Purchases: Evidence on the Importance of Local Supply." *Journal of Financial Economics* 108(2): 425–48.
D'Amico, Stefania, Don H. Kim, and Min Wei. 2018. "Tips from TIPS: The Informational Content of Treasury Inflation-Protected Security Prices." *Journal of Financial and Quantitative Analysis* 53(1): 395–436.
D'Amico, Stefania, William English, David López-Salido, and Edward Nelson. 2012. "The Federal Reserve's Large-scale Asset Purchase Programmes: Rationale and Effects." *Economic Journal* 122(564): F415–F446.
Engen, Eric M., and R. Glenn Hubbard. 2004. "Federal Government Debts and Interest Rates." In NBER Macroeconomics Annual, edited by Mark Gertler and Kenneth Rogoff. Cambridge, MA: MIT Press.
Fabo, Brian, Martina Jančoková, Elisabeth Kempf, and Luboš Pástor. 2021. "Fifty Shades of QE: Comparing Findings of Central Bankers and Academics." NBER Working Paper 27849, National Bureau of Economic Research, Cambridge, MA.
Faini, Riccardo. 2006. "Fiscal Policy and Interest Rates in Europe." *Economic Policy* 21, no. 47 (2006): 443–89.
Ferreira, Thiago, and Samer Shousha. 2021. "Supply of Sovereign Safe Assets and Global Interest Rates." International Finance Discussion Paper 1315, Board of Governors of the Federal Reserve System, Washington, D.C.
Financial Stability Board (FSB). 2020. "Holistic Review of the March Market Turmoil." Financial Stability Board, Basel, Switzerland.
Federal Open Market Committee (FOMC). 2022. "Federal Reserve issues FOMC statement." Press Release, January 26, 2022, Board of Governors of the Federal Reserve System, Washington, D.C.

Gagnon, Joseph E., Matthew Raskin, Julie Remache, and Brian P. Sack. 2011. "Large-Scale Asset Purchases by the Federal Reserve: Did They Work?" *Economic Policy Review* 17(May): 41–59.

Gale, William G., and Peter R. Orszag. 2003. "The Economic Effects of Long-Term Fiscal Discipline." Working Paper 8, Urban Institute–Brookings Tax Policy Center, Washington, D.C.

Gamber, Edward, and John Seliski. 2019. "The Effect of Government Debt on Interest Rates." Working Paper 2019-01, Congressional Budget Office, Washington, D.C.

Goldman Sachs. 2016. "Global Economics Analyst: Printing Presses before Helicopters" Goldman Sachs Economics Research.

Goldman Sachs. 2019. "U.S. Economics Analyst: Q&A on QT and the Future of the Fed's Balance Sheet" Goldman Sachs Economics Research

Goldman Sachs. 2021. "Global Markets Daily: Revisiting Stock/Flow Effects Before Fed Taper (Thakkar)" Goldman Sachs Economics Research.

Greenlaw, David, James D. Hamilton, Ethan Harris, and Kenneth D. West. 2018. "A Skeptical View of the Impact of the Fed's Balance Sheet," NBER Working Paper 24687, National Bureau of Economic Research, Cambridge, MA.

Greenwood, Robin, and Dimitri Vayanos. 2008. "Bond Supply and Excess Bond Returns." NBER Working Paper 13806, National Bureau of Economic Research, Cambridge, MA.

Group of Thirty Working Group on Treasury Market Liquidity. 2021. *U.S. Treasury Markets: Steps toward Increased Resilience*. Group of Thirty, Washington D.C.

Hamilton, James D. 2018. "The Efficacy of Large-Scale Asset Purchases When the Short-Term Interest Rate Is at Its Effective Lower Bound." *Brookings Papers on Economic Activity 2018*(2): 543–54.

Hamilton, James, and Jing Cynthia Wu. 2011. "The Effectiveness of Alternative Monetary Policy Tools in a Zero Lower Bound Environment." *Journal of Money, Credit, and Banking* 44, pp. 3–46.

Hancock, Diana, and Wayne Passmore. 2011. "Did the Federal Reserve's MBS Purchase Program Lower Mortgage Rates?" *Journal of Monetary Economics* 58(5): 498–514.

Hilscher, Jens, Alon Raviv, and Ricardo Reis. 2014. "Inflating Away the Public Debt? An Empirical Assessment." Working Paper 20339, National Bureau of Economic Research, Cambridge, MA.

Kim, Kyungmin, Thomas Laubach, and Min Wei. 2020. "Macroeconomic Effects of Large-Scale Asset Purchases: New Evidence." Finance and Economics Discussion Series, Board of Governors of the Federal Reserve System, Washington, D.C.

Kinoshita, Noriaki. 2006. "Government Debt and Long-Term Interest Rates." Working Paper 06/63, International Monetary Fund, Washington, D.C.

Krishnamurthy, Arvind, and Annette Vissing-Jørgensen. 2011. "The Effects of Quantitative Easing on Interest Rates: Channels and Implications for Policy." *Brookings Papers on Economic Activity* (Fall): 215–87.

Krishnamurthy, Arvind, and Annette Vissing-Jørgensen. 2012. "The Aggregate Demand for Treasury Debt." *Journal of Political Economy* 120(2): 233–67.
Laubach, Thomas. 2009. "New Evidence on the Interest Rate Effects of Budget Deficits and Debt." *Journal of the European Economic Association* 7(4): 858–85.
Li, Canlin, and Min Wei. 2013. "Term Structure Modeling with Supply Factors and the Federal Reserve's Large-Scale Asset Purchase Programs." *International Journal of Central Banking* 9, no. 1, pp. 3–39.
Modigliani, Franco, and Richard Sutch. 1966. "Innovations in Interest Rate Policy." *American Economic Review* 56, pp. 178–97.
Modigliani, Franco, and Richard Sutch. 1967. "Debt Management and the Term Structure of Interest Rates: An Empirical Analysis of Recent Experience." *Journal of Political Economy* 75, pp. 569–89.
Neely, Christopher J. 2013. "Unconventional Monetary Policy Had Large International Effects." Working Paper no. 2010-018D, Federal Reserve Bank of St. Louis, August.
Pelosi, Nancy. 2020a. "Pelosi Statement on Federal Reserve Chairman's Support for Urgent Economic Relief." Newsroom, May 13, 2020.
Pelosi, Nancy. 2020b. "Pelosi Floor Speech in Support of The Heroes Act." *Newsroom*, May 15, 2020.
Powell, Jerome. 2020. "Chair Powell's Press Conference, April 29, 2020." Transcript. Board of Governors of the Federal Reserve System, Washington, D.C.
Powell, Jerome. 2021. "Monetary Policy in the Time of COVID." Speech transcript. Board of Governors of the Federal Reserve System, Washington, D.C.
Rachel, Lukasz, and Larry Summers. 2019. "On Secular Stagnation in the Industrialized World." Working Paper 26198, National Bureau of Economic Research, Cambridge, MA.
Reis, Ricardo. 2017. "Can the Central Bank Alleviate Fiscal Burdens?" Working Paper 6604, Centre for Economic Policy Research, London, U.K.
Reis, Ricardo. 2021. "The Constraint on Public Debt When r < g but g < m." Centre for Economic Policy Research, London, U.K.
Reis, Ricardo. 2022a. "The Fiscal Revenue from Public Borrowing" Working Paper. http://personal.lse.ac.uk/reisr/papers/99-debtrevenue.pdf
Reis, Ricardo. 2022b. "How was the United States government able to borrow so much during the pandemic?" Working Paper. https://personal.lse.ac.uk/reisr/papers/22-aeidebt.pdf
Swanson, Eric T. 2011. "Let's Twist Again: A High-Frequency Event-Study Analysis of Operation Twist and Its Implications for QE2." *Brookings Papers on Economic Activity* (Spring), Brookings Institution, Washington, D.C.
Tedeschi, Ernie. 2019. "Deficits Are Raising Interest Rates. But Other Factors Are Lowering Them." Bonothesauro (blog), February 19, 2019.
TreasuryDirect.gov. n.d. "Monthly Statement of the Public Debt (MSPD) and Downloadable Files." TreasuryDirect.gov. Accessed March 2022 at https://www.treasurydirect.gov/govt/reports/pd/mspd/mspd.htm

U.S. Department of the Treasury. 2021. "Monthly Statement of the Public Debt (MSPD)." Accessed March 6, 2022 at https://www.treasurydirect.gov/govt/reports/pd/mspd/mspd.htm.

Vissing-Jørgensen, Annette. 2021. "The Treasury Market in Spring 2020 and the Response of the Federal Reserve." Working Paper 966, Bank for International Settlements, Basel, Switzerland.

Warnock, Francis E., and Veronica Cacdac Warnock. 2009. "International Capital Flows and U.S. Interest Rates." *Journal of International Money and Finance 28*(6): 903–19.

Williams, John C. 2014. "Monetary Policy at the Zero Lower Bound: Putting Theory into Practice." Hutchins Center Working Papers, Brookings Institution, Washington, D.C.

The COVID-19 pandemic posed an extraordinary threat to lives and livelihoods. In the United States, the pandemic triggered a sharp downturn. Yet, the ensuing economic recovery was faster and stronger than nearly any forecaster anticipated due in part to the swift, aggressive, sustained, and creative response of U.S. fiscal and monetary policy. But when the next recession arrives, it most likely won't be triggered by a pandemic.

Recession Remedies examines and evaluates the breadth of the economic-policy response to COVID-19. Chapters address Unemployment Insurance, Economic Impact Payments, loans and grants to businesses, assistance to renters and mortgage holders, aid to state and local governments, policies that targeted children, Federal Reserve policy, and the use of non-traditional data to monitor the economy and guide policy. These chapters provide evidence and lessons to apply to the next recession.

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